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and **Soil Water Conservation** NEWS

United States
Department of
Agriculture

Soil
Conservation
Service

MARCH-APRIL 1992

Volume 12, Number 6

**Crop-Residue
Management**

Index—Volume 12, Pages 11-13

Cover: Soybeans were no-till planted through grain residue in this Mississippi field. SCS recommends crop-residue management to help producers reduce soil erosion and keep highly erodible lands in conservation compliance. (Tim McCabe photo)

Soil and Water Conservation News is the official magazine of the Soil Conservation Service. The Secretary of Agriculture has determined that publication of this periodical is necessary in the transaction of public business required by law of this Department. Use of funds for printing *Soil and Water Conservation News* has been approved by the Director of the Office of Management and Budget. *Soil and Water Conservation News* (ISSN-0199-9060) is published 6 times a year. Postage paid at Washington, D.C.

Soil and Water Conservation News and other SCS reports are available electronically on the Computerized Information Delivery (CID) System. For subscription information, call 202-720-5505.

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Subscriptions
\$6.00 per year domestic; \$7.50 per year foreign. Single copies \$1.25 domestic; \$1.50 foreign. Send subscription orders to: Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954

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Comments from the SCS Chief:

Crop-Residue Management: A New Tradition in the Making

My working philosophy for more than 35 years of farming has been that every producer and landowner has the duty—yes, even the moral obligation—to use the best technology available for crop production in order to protect our soil and water resources. I am convinced that crop-residue management is one of the best technologies available.

As one of the first producers to use crop-residue management on an entire farm, my beginning motive was to cut costs by cutting the number of trips across the field. But over the years I came to realize how necessary surface mulch was in retaining moisture and sustaining yields. Erosion control was a wonderful bonus. And I learned the competitive advantage you get from investing primarily in management and brain power instead of machinery. It gave me the competitive edge, and today it's changing the whole industry.

I have seen crop-residue management work all over the country. Wherever possible, we need to set aside the plow, which has long been a part of our agricultural heritage. We need to make the more profitable, more soil-enhancing practices that contribute to good crop-residue management part of that farming tradition, that heritage we leave to the next generation. This is especially important, given our growing responsibilities under the conservation compliance provision of the farm law and other environmental initiatives.

But the importance of this technology reaches far beyond our immediate concern for compliance. Its broader benefits now have wide acceptance by the agribusiness community, especially the machine and chemical industries.

We've come a long way in crop-residue management technology. We've dispelled a lot of the myths about herbicide use, environmental sensitivity, productivity, profitability, and flexibility. A lot of attachments and retrofit equipment that convert a planter at a pretty low cost are available now. We also have a new generation of herbicides that are a real breakthrough.

Let me assure you that the technology is there and the help is there: from the Soil Conservation Service, your local conservation district, the Extension Service, and the land-grant universities—that entire system feeding technology and information to the American family farm. And the rewards are there for producers willing to adopt a new tradition in economically and environmentally sound farming.


Chief

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Crop-Residue Management

Crop Residue Covers and Protects the Soil

"SPREADING CROP-residue management technology is one of my highest priorities," said William Richards, Chief of the Soil Conservation Service. "I've been all over the country, in every region, and I've seen crop-residue management systems work."

Richards wants to reach every farmer and rancher with highly erodible land (HEL), and everyone with a conservation compliance plan.

"SCS must be prepared to spend the time necessary to help producers implement crop-residue management systems," he said.

Managing crop residue has been the most widely planned conservation measure in conservation compliance plans to help land users meet compliance provisions of the 1985 Food Security Act and the 1990 Food, Agriculture, Conservation and Trade Act. An estimated 50 percent of the Nation's HEL has been treated, but treating the remaining 50 percent will be more difficult and will require significant shifts in how crop residue is handled.

Richards believes the most critical step is learning improved methods of managing crop residues and communicating them to producers. To do this, SCS and other USDA agencies have developed an action plan, to be implemented at the local level.

This plan, called the Three-Year Action Plan to Accelerate Adoption of Crop-Residue Management, consists of a USDA information component and a USDA technical assistance and technology component.

Each part of the plan is aimed at speeding up assistance to producers, helping them accomplish their conservation compliance plans, and helping them achieve the "conservation advantage" of getting their



This combine, cutting winter wheat in central Kansas, spews crop residue through a spreader in the rear. (Randy Taylor photo; Cooperative Extension System)

How To Measure Residues*

- Use any line that is equally divided into 100 parts. Fifty-foot cable transect lines are available for this purpose. Another tool is a 50-foot nylon rope with 100 knots, 6 inches apart. A 50-foot tape measure using the 6-inch and 1-foot marks also works well.
- Stretch the line diagonally across the rows. Count the number of marks (tabs or knots) that have residue under them when sighting from directly above one end of the mark. It is important to use the same point on each mark for accuracy. Don't count residue smaller than 1/8 inch in diameter.
- Walk the entire length of the rope or wire. The total number of marks with residue under them is the percent cover for the field. If your rope or tape has only 50 marks, multiply by 2; for 25 marks, multiply by 4.
- Repeat the procedure at least three times in different areas of the field and average the findings.

New corn growing through residue



*Although published in a SCS field card, *Farming with Residues*, September 1991, these procedures are rather generalized and were produced for a midwestern United States audience. Consult the SCS field office in your county for local ways to measure residue.

10%



40%



70%



plan measures fully implemented before the 1995 deadline.

The 3-year plan will help local SCS conservationists and other USDA staffs deliver timely information and provide increased technical assistance on conservation compliance to producers. It will build improved technical expertise at State, area, and field office levels. It will help land users better understand conservation compliance provisions and help them maintain their eligibility for USDA program benefits.

Another effort, the Conservation Technology Information Center (CTIC) crop-residue management marketing plan, will use marketing research to develop industry-based marketing outreach techniques. The USDA 3-year action plan will be partly implemented to

respond to the increased demands generated by CTIC's marketing activities.

CTIC enlisted market researchers to conduct separate focus group studies with local USDA employees, farm managers, and farmers in Illinois, Iowa, Kansas, Missouri, Montana, and Washington. The objective was to (1) gain an understanding of attitudes and implementation concerns of USDA employees, and to (2) understand the farmer's opinions, attitudes, and obstacles "up front" in order to design and produce the most effective program of assistance and materials that USDA can provide.

Based on focus group discussions, CTIC began developing a marketing plan last fall that will assist USDA in more effectively reaching producers with in-



These Connecticut corn plantings are prospering, and the small grain residue provided excellent ground cover before and after the corn planting. (Tim McCabe photo)

formation to help them better understand crop-residue management.

The USDA information component of the 3-year action plan will include printed and video materials. SCS has several tasks outlined in this part of the action plan. A video dealing with conservation compliance, in which SCS Chief Richards speaks about crop-residue application as part of conservation tillage, has been completed.

SCS and the National Association of Conservation Districts (NACD) are preparing a national crop-residue management kit. It will include a residue measuring tape, color photos of corn and soybean residues, a guide to ground cover, 10 ways to leave more residue, and 100 answers to important questions on farming with crop residues. A future kit will deal with small grains.

Several conservation tillage factsheets and news releases have been prepared. Tabletop-display sample layouts, radio programs, direct-mail information, and additional printed materials and video presentations are planned. And SCS and other USDA agencies will work closely with the National Association of Conservation Districts regarding crop-residue management.

The USDA technology component of the 3-year plan includes:

- Training;
- Improved measurement technology;
- Workshops and demonstrations;
- Volunteer corps;
- Technical documents;
- Establishment of area/field agronomist positions; and
- Establishment of National Technical Center (NTC) sociologist positions.

USDA will conduct joint training sessions for teaching crop-residue management techniques with SCS, the Cooperative Extension System, USDA's Agricultural Research Service, universities, and agribusinesses. Training will be targeted toward agronomists, SCS district conservationists and other field office personnel, local USDA staffs, agribusiness staffs, and consultants.

Training video modules for use by producers are scheduled. They will be similar to existing "Conservation On Your Own" videos prepared at the West and Midwest NTC's. USDA and the private-sector equipment industry will cooperate in providing updated,

SCS State conservationists will continue to use volunteer farmers to help other farmers implement crop-residue management systems.

consistent information regarding residue dispersal by various ground tools.

Technology that USDA agencies are collaborating on includes improving procedures for estimating residue amounts used in the wind erosion equation model to replace the small grain residue equivalent; establishing a policy for measuring surface residue; and developing automated and improved measurement tools for field use.

In connection with the Soil and Water Conservation Society, USDA has conducted a national crop-residue workshop. The NTC's and various USDA regional, State, and local offices will conduct similar workshops.

SCS State conservationists will continue to use volunteer farmers to help other farmers implement crop-residue management systems.

SCS will finalize and issue new technical agronomy standards for no-till, strip-till, ridge-till, and mulch till and for seasonal residue management. NTC's and SCS State offices will prepare "how-to" materials and factsheets.

Various private and public organizations, including SCS, will establish 100 to 200 local county agronomist positions in locations where a heavy conservation compliance workload exists. Agronomists will assist in training, solving technical problems, conducting demonstrations, and providing direct farmer assistance.

Sociologist positions are proposed for the West and Midwest NTC's to provide assistance and training on marketing techniques.

In preparation is an extensive guidebook on marketing procedures for field offices. This marketing information is being developed by researchers from the University of Kentucky, based on focus group meetings with producers and SCS employees in Arizona, California, Iowa, Kentucky, New Jersey, and Texas.

Marketing and selling of conservation measures to land users at the local level will be quite important if USDA is to successfully assist producers in completing their conservation compliance plans by 1995.

The State soil and water conservation districts in Delaware and Iowa are carrying out marketing research surveys. In Delaware, USDA field staffs will work with district employees to develop a localized marketing plan in New Castle County. Crop demon-

10 Ways To Leave More Residue*

- Follow a crop rotation sequence with crops that produce high residue. High yields give more residues.
- Wait until spring for tillage operations. This is important on soybean ground.
- Reduce the number of tillage passes. In most cases, this is as important as the type of tillage performed.
- Plant rye or wheat as winter cover crops, especially when growing low-residue crops such as soybeans.
- Set chisels and discs to work shallower; otherwise residues can be buried.
- Stop using the moldboard plow.
- Drive slower on tillage operations. Driving faster throws more soil and covers more residue.
- Use straight shanks and sweeps on chisel plows instead of twisted shanks. Twisted shanks may bury 20 percent more residue.
- No-till drill soybeans instead of planting them conventionally. No-till drilling keeps more residue on the soil surface.
- Convert to a no-till system. No-till disturbs residue only in the row.

* These ideas were originally produced for a midwestern United States audience. Consult the SCS field office in your county for local ways to improve residue dispersal.

stration sites are being established. In Iowa, the State organization has completed a survey to identify farmer needs in conservation planning and implementing crop-residue management techniques.

The SCS goal—as a part of the USDA goal—is to bring farmers into a positive frame of mind regarding conservation compliance and to assist them in implementing their conservation plans by December 1994.

"We must work together as a team if the challenge ahead of us is to be accomplished," added SCS Chief Richards.

Paul G. DuMont, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

The Ancient Art of Soil Conservation

The article "The Ancient Art of Soil Conservation" by **Karen Wolfe Hendrix** was published in the *Soybean Digest* in January 1991. It is reprinted with permission and has been adapted to meet the needs of this publication.

TERRACED land in Indonesia that has been in production for 500 years and is still fertile. Fragile Brazilian soils that must be held in place to sustain crops. These were Rick Murdock's training grounds for being a steward of the soil.

As the son of John Murdock, the chairman of the University of Wisconsin Soil Science Department, Rick lived all over the world, following his father's assignments in teaching and research. As he traveled, he learned many valuable lessons in the ancient art of soil conservation.

In 1978, Rick Murdock took the modern-day version of these skills to his family's Ponderosa Farms, near Murray, Ky. He and his father farm 800 acres, raising soybeans, corn, wheat, dark-fired tobacco, timber and cattle.

The past 13 years of hard work were recognized in 1989 by the National Endowment for Soil and

Water Conservation when it named Murdock as one of three national winners in its soil conservation contest.

When bought, the land was badly eroded, Murdock remembers. Slopes range from 2 percent to 8 percent, with an average of 4 percent to 5 percent.

"My beginning goal was to get soil loss down to T, in which the land naturally generates as much soil as it loses," he [Murdock] says.

He started his campaign against soil erosion at his Soil Conservation Service office. "We began working with [USDA's] cost-sharing program," Murdock notes.

In 1989 he finished an \$11,000 long-term agreement with [USDA] that included installing two waterways, one diversion and a pair of rock structures. He began an \$18,000 agreement in 1990.

"In the winter we'll go to the SCS office and look at maps of each field. We'll pick one field to work on each year, define the problem and plan our strategy for spring. We walk over the snow-covered fields to look at the land and find the best solution."

Since 1978, Murdock has found several solutions to his problems: two erosion-control ponds, five rip-rap grade stabilization structures, two diversion ditches and six waterways.

A change that came easily was no-till. He completely switched to it in 1984. "I can easily run one tractor and drill over 400 acres because no-till is the perfect medium in which to plant."

Murdock doesn't believe skeptics who say no-till is more expensive. "I've had test plots, and conventional tillage has never economically out-yielded no-till. Even if you think you're making money with conventional tillage, you're losing money due to the loss of soil," he contends.

The mulch's water-holding capacity is a major benefit for Murdock. Water erosion is his main nemesis. By using no-till, he can apply 1-1/2 inches of irrigation water per hour without fear of runoff, compared to only 6/10 of an inch on conventional tillage.

Murdock's no-till rowcrop program consists of a corn/wheat/soybean rotation. He no-tills corn into bean stubble, then disk chisels to incorporate corn stalks before planting wheat. He applies phosphorus and potassium for the wheat and following soybean crop.

Murdock's per-acre production cost is \$80 to \$90. He averages 25 to 35 bushels per acre of doublecrop beans, 136 bushels of corn and 51 bushels of wheat.

By using his soil wisely and efficiently, Murdock hopes to be a good example.

"It's important to show our neighbors and city people that we are responsible stewards of the soil," he stresses. "I feel fortunate to have observed successful techniques on other farms throughout the U.S. and the world, and hopefully my practices have found their way onto other farmer's soils."

Even to the naked eye, trees planted using the no-till system...were taller, had larger diameters, and had higher survival rates.

No-Till Technique Helps Trees

NO-TILL PLANTING systems, mostly used for grain crops on highly erodible land, have also been successful in growing hybrid poplars. This discovery was an unexpected side benefit of a joint research effort of the Soil Conservation Service and the State University of New York (SUNY) at Syracuse.

At the time, researchers at SCS's Big Flats Plant Materials Center (PMC) in Corning, N.Y., and SUNY's College of Environmental Sciences and Forestry (ESF) were studying various techniques in growing hybrid poplars for future use in energy production.

The project began with a Canadian study involving over 300 different clones of poplar. This study, which involved biomass production for energy usage on a rotating basis, adapted a specific clone to a specific soil.

In order to try to duplicate the Canadian study, the SUNY/ESF staff obtained tree clones from Canada that were specific to soil types in New York and used nine clones for their experiments. Big Flats PMC contributed space for two experimental plantings.

But the researchers quickly discovered that clean-cultivation techniques used by the Canadians wouldn't work. These techniques involved deep plowing and no



In a hybrid poplar study at SCS's Big Flats Plant Materials Center in Corning, N.Y., saplings were planted using no-till ground treatment, and growing techniques were studied for future use of hybrid poplars in energy production. (Martin van der Grinten photo)

cover for the first 2 years. Because of the sloping agricultural land in New York, they were losing 70 tons per acre of soil in the 2-year period.

The SUNY/ESF staff, with the aid of the Big Flats PMC, redesigned the experiment and developed a new project to apply no-till technology to poplar plantations.

Three establishment systems were compared: two plots were planted in living grass cover, two were planted using the Canadian clean-cultivation technique, and two were planted using no-till (planting into chemically killed grass cover). Control of competing weeds was accomplished by spraying herbicides in the clean cultivation and no-till sites for 2 years.

After 3 years, the results were convincing. Even to the naked eye, trees planted using the no-till system, compared to the other systems, were taller, had larger diameters, and had higher survival rates.

In measuring volume of wood, the two plots planted by no-till had

4,744 cubic centimeters (cm^3) per tree.

Trees planted in clean cultivation had 2,711 cm^3 per tree. And those planted in living grass cover had 162 cm^3 per tree.

Poplar trees grow approximately 25 feet high in 5 years. They can be grown worldwide and are adaptable to both wet and dry soils. They provide wood for fuel and for lower value products. In plantation culture, they can produce high growth rates per acre and make productive use of abandoned or highly erodible agricultural land.

This study enabled SCS to beneficially adapt the agricultural conservation technology to agriforestry systems to increase biomass yield and control soil erosion.

Martin van der Grinten, manager, Big Flats Plant Materials Center, SCS, Corning, N.Y.; **John A. Dickerson**, plant materials specialist, SCS, Syracuse, N.Y.; and **Russ A. McKittrick**, graduate student, SUNY/ESF, Syracuse, N.Y.

Strip Tillage Improves Cotton Yield

“WE HAVE NOT come under a bale since we started 7 years ago, and we had never made that much before we started strip tillage,” says Lonnie J. Shedd, a farmer in Holly Pond, Ala.

Shedd was talking about growing cotton by the strip-tillage method of conservation tillage. He and his sons, Chris and Garey, decided 7 years ago to plant all their cotton in the strip-tillage system. They were so pleased with the re-

sults that they sold their conventional equipment within 2 years of changing systems.

Their yields have increased each year. In 1990, on about 300 acres, they averaged 600 pounds of lint (fiber remaining after the seed is removed) per acre, compared to the county average of 450 pounds, in one of Alabama's driest years on record.

Their system includes 2-year rotations of cotton, soybeans, and a grain. Into wheat or rye residue, they plant cotton; into the cotton residue, wheat or rye; into the grain residue, soybeans by strip tillage; and into the soybean residue, wheat or rye.

“The ground was hard, and we could not get a plow in it before strip tillage,” said the elder Shedd. “Our shallow soil has a hard clay subsoil which wore out two sets of plow points a day when we were

plowing cotton. Now all that residue has rotted, and the soil is loose and is easy to work.”

Shedd has a strong conservation ethic that he has instilled in his sons. He believes farmers have an obligation to protect the soil and water resources they use. The Shedd's have found that strip tillage is cost-effective and that it protects both soil and water.

“The tractor and planter make one trip over the field. Before strip tillage, we made one trip with the chisel plow, two or three trips with the disk, and then a trip with the planter,” Chris Shedd said. “Strip tillage saves fuel, equipment, and labor.”

Judy Hill, district conservationist in Cullman County, says the in-row subsoiling on the Shedd's farm is helping to break up the plow pan and is increasing rooting depth. She says about 50 percent of the cotton now planted in the county is by the conservation-tillage method, compared to 10 percent a few years ago.

The Shedd's rent nearly 99 percent of the land they farm. According to them, the owners are pleased with their farming methods because muddy water doesn't run out of the fields after heavy rains.

“Cotton can be grown successfully by farmers who decide to use the system and then make it work as the Shedd's have done,” said Ken Rogers, SCS conservation agronomist for Alabama.

Morris Gillespie, public affairs specialist, SCS, Auburn, Ala.



Lonnie Shedd, right, cotton farmer in Holly Pond, Ala., and Judy Hill, SCS district conservationist at the Cullman field office, discuss the conservation tillage techniques Shedd used in 1990—a very dry year—to reach an average harvest of 600 lbs. of lint per acre. (Morris Gillespie photo).

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Conservation Farms

Farms Show Pride

THIS PROGRAM is not another awards program. It is not a contest. It is a simple recognition program designed to focus attention on the positive things that farmers and ranchers are doing to protect the environment," explained Gerald Digerness, president of the National Association of Conservation Districts (NACD).

NACD began the Take Pride in America Conservation Farm Program in 1990 in cooperation with the U.S. Department of Agriculture, the National Association of State Conservation Agencies (NASCA), and the Goodyear Tire & Rubber Co.

Through the program, the sponsors hope to spread their message:

"America's farmers and ranchers are caring stewards of the land."

"We should be a step ahead, because environmental issues are not passing," noted Kurt Ehnle, whose Illinois property was named a "Take Pride in America Farm." "The agricultural world must make the rest of society aware of what they are doing to protect the environment. We need to be proactive rather than reactive."

The Peoria County Soil and Water Conservation District (SWCD) picked Ehnle for the program for his use of sound soil and water conservation practices. Ross Pauli and Gary Rosenbohm were also chosen for recognition.

All three farmers also participate in the Neighbor-to-Neighbor program,* giving other land users the chance to see the conservation practices used on their "model" farms.

Over 700 local conservation districts in the 50 States, Guam, Puerto Rico, the U.S. Virgin Islands, and the Northern Mariana Islands

have recognized outstanding farms and ranches. The district cooperators are recognized for applying conservation plans on their properties that address erosion, water quality, wildlife habitat, forest management, animal waste, and related concerns.

The honored cooperators are given colorful, double-faced, 2-foot by 3-foot roadside signs that are posted on the "Take Pride" properties.

Local conservation districts organize farm tours, media events, award ceremonies, and other activities to share conservation successes with farmers, the media, and the public.

The program is unusual because it is a joint venture involving the public and the private sectors. Conservation districts receive Federal and State support from USDA, NASCA, and NACD. Goodyear brings the private-sector perspective to the partnership.

"The public has been increasingly concerned during the past



Take Pride in America farmers, from left, Ross Pauli, Kurt Ehnle, and Gary Rosenbohm, show off their farm signs awarded by the Peoria County (Ill.) SWCD. (Kay Kitchen-Maran photo)

few years about how agricultural activities impact the environment," Digerness summed up. "No doubt the problems and concerns need to be dealt with, but by the same token, attention should also be directed to the many conservation successes."

Leona Gonzales, former SCS public affairs specialist intern, assigned to National Association of Conservation Districts, League City, Tex.

* An article about the Neighbor-to-Neighbor program appeared in the September-October 1990 issue of the *Soil & Water Conservation News*.

How To Take Part

Every conservation district in the United States can participate in the Take Pride in America Conservation Farm Program. It is a way to promote conservation and the district's work in the community while recognizing an outstanding conservation farm or ranch. Steps to implement a successful program include:

- Reviewing the district packet distributed by the National Association of Conservation Districts

(NACD) that provides additional information;

- Ordering a free property sign from NACD. The order form is included in the packet;
- Developing judging criteria, then selecting a farm or ranch for recognition;
- Organizing and publicizing an event to highlight the chosen farm;
- Posting the TPIA sign on the selected property and holding the recognition event; and
- Evaluating the program and integrating future TPIA activities into the district's annual plan of work.

Over 35 Years of Farm/City Tours

Jefferson County, Ohio, is bordered on the east by the Ohio River. The county's 262,000 acres contain 850 farms.

Out of a 91,500 county population, some 56,000 people live in urban areas, especially the city of Steubenville.

From this unique blend of rural and urban living, the Jefferson Soil and Water Conservation District (SWCD) Farm/City Tour began over 35 years ago.

In the 1950's, Emerson "Tip" Wood of the Steubenville Area Chamber of Commerce recognized the importance of the local agricultural industry and looked for a way to say "thank you" to Jefferson County farmers. Wood asked the Soil Conservation Service and the Jefferson SWCD to assist in planning a conservation recognition banquet for area farm families. Then SCS district con-

servationist Robert Jones and technician Gabe Rozsa helped organize the event.

To return the gesture, farm families and SWCD cooperators invited the Chamber of Commerce and other civic groups to spend a day on the farm. In 1991, exactly 37 years later, the Jefferson SWCD held its Farm/City Tour on the traditional date, the second Wednesday in July.

"With the world's agricultural technology changing as rapidly as it is, these annual tours are a good way to keep the public informed about agriculture," said William Parker, former chairman of the Jefferson SWCD Board of Supervisors. "Besides a chance for fellowship, it gives people a chance to see what other farmers are doing to conserve soil."

Those attending the Farm/City Tour can take a tractor-hay wagon ride to see conservation practices at work, including contour strips, pasture improvements, spring developments, and animal-waste storage facilities.

SCS representatives, as well as those from the Extension Service, the Agricultural Stabilization and Conservation Service, and the Ohio Department of Natural Resources, are on hand to explain the operation and benefits of these practices. The tours have been held rain or shine.

Also part of the tour is a display of farm machinery provided by local equipment dealers. Each year some 500 people sit down to a noon repast of homemade food.

"The 1991 event marked my fifth year helping to plan the tour," said Thomas Perrin, SCS district conservationist, Wintersville, Ohio. "An interesting addition was the groundbreaking ceremony for a resource conservation and development project to improve drainage and prevent flooding at the Jefferson County fairgrounds."

Patricia Perry, former Jefferson SWCD secretary, Wintersville, Ohio

Research

Laboratory Learns Soil Is Dynamic

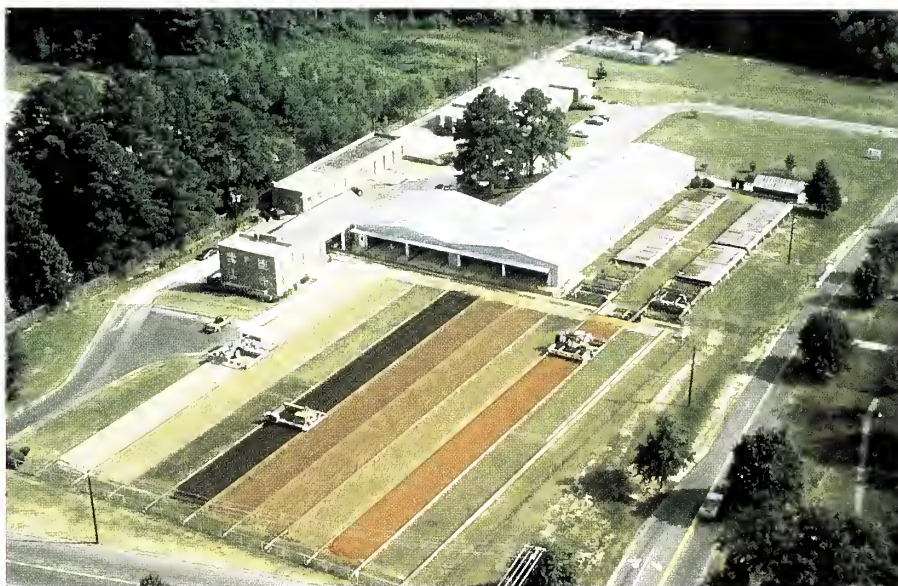
“WHEN SOIL is tilled, it doesn't take much force to compact the particles into a tighter arrangement,” Albert Trowse has found.

Over the years, his studies have shown that “compacted soil causes plant roots to grow slowly. After a hard thunderstorm, the water will run off this soil rapidly. If soil is not compacted, water will be absorbed where it falls.”

Though retired, Trowse has a small office at the National Soil Dynamics Laboratory in Auburn, Ala., where he continues his research. The laboratory, run by the Agricultural Research Service, is vitally interested in studying the effect of soil compaction on crop production.

“We also have a study to measure soil erosion through runoff and sediment amounts and are making progress on a mathematical model that can use such factors as the type of soil being tilled and the amount of air pressure in farm machinery tires to predict soil compaction,” noted Eddie Burt, laboratory research leader. Another laboratory study concerns the effects of using conservation tillage.

The laboratory headquarters are located on the campus of Auburn University. The laboratory's



The strips in the foreground are bins containing representative U.S. agricultural soils at the National Soil Dynamics Laboratory. (Agricultural Research Service photo)

six engineers and three plant scientists also use the Alabama Agricultural Experiment Station farm, about 30 miles away, as the setting for much of their research.

“We're using a wide-frame vehicle that spans a cropping area 20 feet wide, so there is no traffic over the area where the roots will grow,” said Burt. The vehicle helps test different methods of planting and growing crops, including a winter wheat crop. This “controlled traffic” method of cultivation has registered some gains in crop yields, especially when it is tried on sandy soils.

The laboratory houses two unique areas. One area is a group of 11 soil bins, 2 located indoors and 9 outdoors, containing 13 representative U.S. agricultural soils. Each bin can be used for soil dynamics research with full-scale traction and tillage devices. A computer can be attached to record data.

The other is a plant root observatory, or rhizotron, that has 20 containment units. Through the units' glass fronts, root growth and development during a plant's life can be observed and measured.

The laboratory was initially founded in 1933 at Auburn University and called the Farm Tillage Machinery Laboratory. “The original idea was to try to improve the traction of steel-wheeled tractors, especially on sandy soils, where they often became stuck,” explained Burt. Over time, the modern idea of the discipline of soil dynamics grew out of the laboratory's research program. About 1985, the laboratory's research emphasis shifted to additional work on the effects of soil compaction.

Mary Jo Stine, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

Plants for Conservation

Oregon's Quest for Better Plants

The article "Searching for Better Native Species" by **Dick Yost** was published in the *Oregon Farmer-Stockman* in February 1990. It is reprinted with permission and has been adapted to meet the needs of this publication.



Dale Darris, Corvallis, Ore., plant materials center manager, records observations at one of the center's blue wildrye plots.

STREAMBANKS, clearcuts, water drainages, and pasturelands all have two things in common: they are places just looking for erosion to happen, and all will benefit from work being done by Dale Darris and the staff at the U.S. Department of Agriculture's Plant Materials Center (PMC) in Corvallis, Ore.

This PMC, operated by the Soil Conservation Service, was established in 1957. It is one of 26 similar centers across the United States set up with the goal of assembly, selection, increase, and release of improved grasses, legumes, and shrubs for soil and water conservation.

According to Darris, the PMC manager, 13 woody plant, 8 grass, 6 legume, and 2 sedge species are currently being tested and propagated at the PMC. "If there is any question about the need for such work, take a look at the nearest streambank or hillside, whether disturbed by grazing cattle or road equipment, to see the havoc rains can create on unprotected soils."

That's where efforts of the PMC come in, Darris explains. By col-

lecting and propagating native plants from many growing climates in western Oregon, western Washington, and northern California, adapted and improved seed stocks can be developed to encourage rapid ground cover growth and stabilization.

"About 80 percent of the grasses and shrubs we are working with are native species, and that percentage is increasing," Darris said. "We know that local sources of native species are well adapted to a particular habitat and climate and are going to be best suited for such things as rapid streambank and roadside stabilization, and providing more natural wildlife habitat."

Currently the PMC staff is seeking plant solutions for problem areas identified by the SCS technical and advisory committees. The PMC's newest program goal is to find plants suitable for wetland restoration and water quality improvement.

The PMC expects to be winding up evaluations on several grasses and shrubs in the next 3 to 4 years, according to Darris. Of most immediate interest to livestock producers are two grasses, western fescue and blue wildrye.

Western fescue is targeted, Darris said, toward woodland and rangeland seedings in western Oregon and Washington. The grass will provide erosion control and increase forage production and may also be useful as a cover crop on orchards, vineyards, and Christmas tree plantations.

The blue wildrye is described as a native, loosely tufted, perennial grass that grows 3 to 6 feet high. The species establishes readily and is intermediately shade tolerant.

"This wildrye is a rapid reseeder and should be used as a quick, self-perpetuating cover on clearcuts, recently burned timberland, logging roads, and other steep, eroding areas," Darris said.

"One of our goals is to develop some of the first native varieties adapted specifically to our area," Darris added. "There's a lot of genetic diversity out there."

"By searching for new seed sources, evaluating them, and then, when warranted, propagating and using them, we can put that diversity to better use for public land managers, producers, and the general public."

Seeing Leads to Believing

VISITORS can trust their eyes at the Fugle's Mill Plant Materials Evaluation Site near Rochester, Minn. They can look over nine varieties of big bluestem grass, as well as other grasses, growing in 12- by 60-foot plots. A few glances tell which of 37 warm-season grass varieties grow best in southeast Minnesota.

"We encourage landowners to select native, warm-season grasses like those grown at Fugle's Mill for their conservation reserve plantings in this area," noted Jerry Hildebrandt, Soil Conservation Ser-

vice district conservationist in Rochester.

SCS sponsors the comparison plantings on land owned by the Minnesota Department of Natural Resources (MDNR). Other sponsors who signed a 1985 cooperative agreement to manage the site are the Olmsted Soil and Water Conservation District, the Southeastern Minnesota Association of Soil and Water Conservation Districts, and the Hiawatha Valley Resource Conservation and Development (RC&D) Council.

"We had to make a good case for this use because the acreage is classified as highly productive agricultural land. But now we've seen just how many farmers are interested in this site," said Kurt Hinz, MDNR district forester, Rochester.

After the 1985 agreement, the Fugle's Mill site was first used solely as a research area on plant

growth. "We duplicated the different plantings in four replicated blocks so that growth results were statistically reliable," explained Hildebrandt.

In addition to grasses suited for erosion-control and animal-forage purposes, 74 species of trees and shrubs are grown that provide effective farmstead and field wind-breaks.

Every 2 weeks during the growing season, volunteers note the characteristics of plant growth in each of 148 plots. Findings are particularly valid for the surrounding 18-county area of southeast Minnesota, northeast Iowa, and southwest Wisconsin. Evaluations are closely coordinated with the SCS national plant materials program through the assistance of the SCS Plant Materials Center at Bismarck, N. Dak., which serves all of North Dakota, South Dakota, and Minnesota.



Kurt Hinz, district forester, MDNR, left, discusses black walnut tree management with Bill Oehlke, Olmsted SWCD supervisor. (Michael Price photo)

Some grasses and shrubs tested at the site have been released through the SCS national plant materials program to commercial growers for propagation and seed increase.

Last year the cooperating agencies emphasized the educational role of the Fugle's Mill site. "The Hiawatha Valley RC&D Council made it a goal to develop the site as the focal point of an areawide public education initiative about conservation plant materials," said Roger Lenzmeier, the RC&D coordinator.

"We wanted to put up a dual-purpose building to display an information exhibit about the plant materials grown here and to store equipment. We were happy to lead the search for grants," said Myron Standke, chairman of the Hiawatha Valley RC&D Council.

As a result, two private grants were secured to finance capital campaign improvements. These conditional grants helped to obtain matching funds from other groups to establish a maintenance endowment fund.

The local Stewartville High School FFA Chapter was contacted about volunteer opportunities.

"The students were excited about the site and voted to take on the building project," according to Eric Deters, chapter advisor. Last fall some 25 students volunteered their efforts to construct a 22-foot by 22-foot pine and cedar structure. The chapter performed the work as a Building Our American Communities project.

Jolene Lange, FFA chapter president, explained, "I'm considering a career in agriculture and my parents have land in the Conservation Reserve Program, so these grasses



Myron Standke, Chairman, Hiawatha Valley RC&D Council, left, joins Jolene Lange, of the Stewartville FFA chapter, and Eric Deters, Stewartville FFA chapter advisor, to look at the "turkeyfoot" growth form of the big bluestem grass at Fugle's Mill. (Michael Price photo)

and shrubs mean a lot to me. The chapter plans to stay involved with Fugle's Mill."

Outreach efforts have continued while the interpretive displays are designed and built. Some grasses and shrubs tested at the site have been released through the SCS national plant materials program to commercial growers for propagation and seed increase. Cooperating sponsors provide a list of local suppliers to farmers and suburban landowners.

"I came to Fugle's Mill to see what warm-season grasses look like fully grown," said Karl Rowley, who advises the Boy Scouts'

Gamehaven Council. "We're planning a summer camp nearby and will plant 50 acres of the property in these grasses."

Another community spinoff is continued planting of warm-season grasses on the grounds of the International Business Machines plant in Rochester.

"The Fugle's Mill site is a great local conservation resource," summed up Bill Oehlke, Olmsted Soil and Water Conservation District supervisor.

Mary Jo Stine, associate editor, *Soil & Water Conservation News*, SCS, Washington, D.C.

Plant Studies Help Ranchers Make a Living

RANGELAND IN northern Nevada takes quite a beating. Wildfires, insects, mining, and drought take a toll on the land and the major agricultural enterprise in the area—livestock grazing. Unproductive soils, unpalatable plants, and severe wind erosion make it even more difficult for many ranchers in Nevada to make a living.

Realizing the need to improve the health and productivity of the rangeland, Soil Conservation Service range conservationist Craig Plummer at Winnemucca, Nev., and Chris Hoag, assistant manager at the Aberdeen Plant Materials Center (PMC) in Idaho, joined forces to identify plant species that could thrive under such adverse conditions.

Plummer and Hoag devised a plan to test different herbaceous and woody plant species for their adaptability and hardiness.

Plummer selected two sites on the T bar 6 Ranch near Paradise Valley, Nev., that are representative of many of Nevada's soils and arid range sites. Frank Tschannel, a cooperator with the Paradise Valley Conservation District (PVCD) and owner of the ranch, agreed to loan SCS 35 acres for the 10-year study.

The Sonoma and Paradise Valley Conservation Districts, the Bureau of Indian Affairs, the Nevada Division of Forestry, and SCS purchased materials and donated labor to build two exclosures and install a fully automated drip irrigation system. Also, the PVCD received a \$4,900 grant from the Nevada Conservation Commission to purchase a sophisticated, solar-powered weather station to study soil and plant relationships.

Two Off-Center Advanced Testing Sites (OATS) were established at the T bar 6 Ranch site. Studies at the two sites will compare many

varieties and accessions of grasses, forbs, shrubs, and trees for use in rangeland rehabilitation, mine reclamation, and windbreak-shelterbelt plantings.

"These studies may show which plants are adapted to northern Nevada's arid to semi-arid climate," Plummer said. "We also expect them to show the optimum row spacing for establishing herbaceous and woody plants on rangeland and the best seeding rate."

The Windbreak-Shelterbelt OATS tests trees and shrubs for farmstead, feedlot, and field windbreaks. The soils on the site are typical of those found on many farms and ranches in northern Nevada.

More than 650 varieties of shrubs and trees were planted during the spring of 1991. About 750 plants will be added this spring to complete the planting. The study will evaluate more than 40 different plant groups in four different precipitation zones.

"The Aberdeen PMC will evaluate plantings semiannually during the 10-year study," according to Hoag. "Information gained from this effort will be made available to local ranchers and other land users, such as mining companies and State and Federal agencies."

Liz Warner, public affairs specialist, SCS, Reno, Nev.



Habitat on the T bar 6 Ranch near Paradise Valley, Nev., is representative of many of Nevada's soils and arid range sites. SCS arranged to use 35 acres on the ranch for a 10-year study to test different herbaceous and woody plant species for their adaptability and hardiness. (Craig Plummer photo)

'Do Not Disturb' In Michigan

In Michigan the Soil Conservation Service and the Michigan Association of Conservation Districts' new campaign theme is "DO NOT DISTURB." The purpose is to promote conservation tillage in order to control soil erosion and protect water quality.

"Mulch till and no-till conservation tillage are usually considered spring practices, but they really begin in the fall," said Jerry Grigar, conservation agronomist for the Soil Conservation Service in East Lansing, Mich.

"The residue of the previous crop has to stay on the surface or be replaced with a cover crop for mulch till or no-till to be viable options next spring."

"The best advice we have for farmers who expect to use no-till or mulch till conservation tillage next spring to control erosion and protect water quality is 'Do Not Disturb' the residue left from this year's crop," Grigar continued.

Grigar considers crop-residue the best and most cost-effective means a farmer can use to prevent erosion by wind and water during the winter and next spring when storms are the most intense. The secret, he said, is to insulate the land from strong winds and hard rains.

There is usually enough residue left after harvesting crops to provide the cover needed to prevent soil erosion. If there isn't enough residue, then a good cover crop will provide the protection needed.

Grigar also operates a farm in Gratiot County and has been a no-

till farmer for the past 9 years. He actively follows the advice "Do Not Disturb" on his own farm.

Part of the Do Not Disturb campaign is a special door hanger that reminds farmers not to disturb crop-residue in order to protect soil and water resources and improve profits. The door hangers are available in Michigan Soil Conservation Service offices and will be distributed by conservationists during farm visits.

Roger Howell, public affairs specialist, SCS, East Lansing, Mich.

GIS Helps Producers Get 'Easy Access'

Eight U.S. Department of Agriculture pilot projects in 15 locations are scheduled to be in operation in time for spring 1992 farm program signup activities. The projects have been designed to give farmers and ranchers "Easy Access" to USDA services. The Soil Conservation Service's geographic information systems (GIS) is one of the projects selected, with Rockingham County, Va., as the test site.

Last summer a task force comprised of five USDA agencies—the Agricultural Stabilization and Conservation Service, Soil Conservation Service, Farmers Home Administration, Federal Crop Insurance Corporation, and the Office of Information Resources Management—produced about 70 ideas for improving USDA service to pro-



Door hangers are part of the "Do Not Disturb" campaign that reminds farmers not to disturb crop-residue left on the land. (Roger Howell photo)

ducers. From those ideas, eight projects were chosen for further review.

The GIS project uses maps, imaging technology, and resource data to provide analyses of agricultural areas with onscreen visual overlays of farmers' fields, contrasting highly erodible areas with rotational planting patterns. Farmers will be able to visualize immediately the impact of various planting options to help determine how to best manage the land and what conservation practices might be needed.

GIS captures, manipulates, analyzes, and displays geographic data that includes maps and im-

ages. It also links these geographic layers to tabular data bases, such as cooperator records or soils data bases.

GIS technology gives the following information quickly:

- Soil type by field;
- Distance measurement such as lagoon to stream;
- Cropland fields with over 50 acres of highly erodible land; and
- Soil loss calculations.

GIS facilitates data-sharing and collaborative efforts that bring all the information together to solve a total resource problem. SCS selected Geographic Resources Analysis Support System (GRASS) GIS for agency support; this is the

software also being used for the Easy Access GIS project. SCS has approximately 130 GRASS sites nationwide.

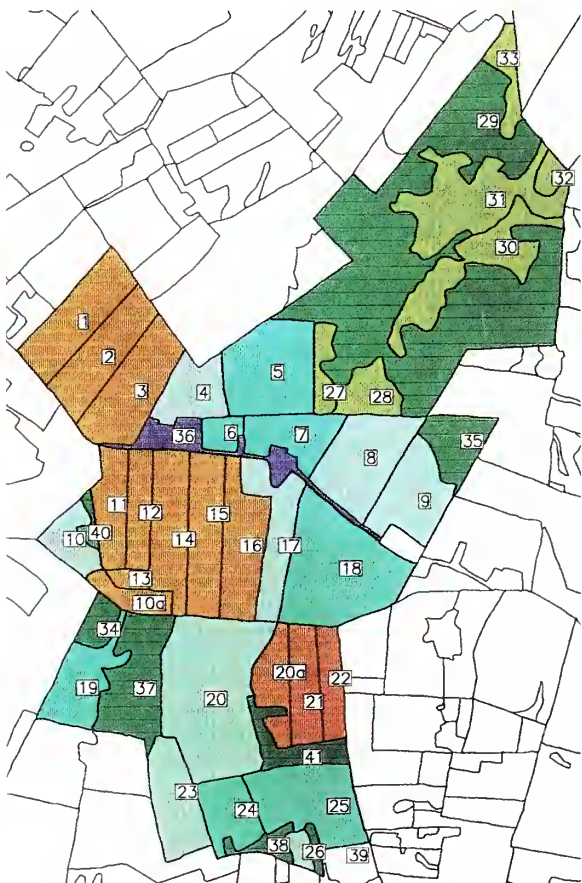
According to Gale TeSelle, director, SCS Cartography & Geographic Information Systems Division, two challenges face SCS in implementing GIS: making it simple to use and building the needed geographic data bases.

To keep GIS simple, SCS is developing interfaces between GRASS GIS and SCS specific applications and data bases. The objective is to generate frequently required map products quickly without detailed knowledge of GRASS commands or advanced GIS concepts.

SCS will focus on building field boundaries, soils, elevation, roads, and streams as the primary geographic data bases for field office GIS application. Conventional photography has too much image inaccuracy when inputted into GIS, so orthophotography, which is distortion free, is being promoted as the standard base map for field use. Soils have been mapped, in many instances, using orthophotography, and ASCS is looking at using orthophotography for maintaining field boundaries.

With an integrated GIS approach, farmers will no longer need to visit numerous USDA field offices to gather and analyze information. USDA agencies will work together to maintain all the farm information linked locationally to the farmer's field.

News Briefs is compiled and edited by **Kim Berry Brown**, contributing editor, *Soil & Water Conservation News*.



This conservation-plan map printout was created with geographic information systems (GIS) technology. GIS is one of eight pilot projects designed to give farmers and ranchers "Easy Access" to USDA services.

Soil Management For Agricultural Sustainability

Edited by R. Lai and F. J. Pierce

Sustainable agricultural processes, management options, and policy issues and priorities are examined in a 1991 publication released by the Soil and Water Conservation Society

(SWCS). It is a collection of 14 manuscripts presented at a 1991 international conference on soil management for sustainability.

The information updates areas in soil management critical to maintaining a productive and sustainable soil resource base for future generations, including soil structure, soil compaction, and predicting soil erosion and its effects on crop productivity.

The book also covers such management options as conservation tillage, use of organic wastes, and farming by

soils. Many chapters explore research needs and priorities.

Students can use this as a text or reference on sustainable agriculture. It will be appropriate reading for scientists, conservationists, policymakers, and others interested in sustainable agriculture worldwide.

Single copies of this 189-page publication are available for \$15 softbound (discounted for SWCS members) from the SWCS, 7515 N.E. Ankeny Road, Ankeny, IA 50021-9764; telephone 1-800/THE-SOIL.

The Complete Guide to Environmental Careers

By The CEIP Fund

How successfully the United States tackles its environmental problems will depend on the next generation of environmental professionals who will need to know where and how they can put their skills to work.

For recent college graduates, volunteers, career counselors, career changers, and young professionals, this book is a source on environmental career opportunities.

It provides information that is essential for planning any career search including job outlook, salary levels, volunteer and internship opportunities, and entry requirements in this field. Case studies discuss how environmental organizations, government, and industry are working to manage and protect natural resources.

In-depth interviews detail the day-to-day responsibilities of more than 100 professions in the fields of:

- Solid and hazardous waste management;
- Environmental education and communications;
- Air and water quality;
- Land and water conservation;

- Wildlife and fisheries;
- Parks and outdoor recreation; and
- Forestry.

[Established in 1972, the Center for Environmental Intern Programs (CEIP) Fund offers a career-training program that places college students and recent graduates in short-term, paid, professional-level positions with corporations, consulting groups, government agencies, and nonprofit organizations. For more information, contact CEIP, 68 Harrison Avenue, 5th Floor, Boston, MA 02111; telephone 617/426-4375.]

This 328-page, illustrated book is available for \$24.95 (cloth) or \$14.95 (paper) at Island Press, Box 7, Covelo, CA 95428; telephone 1-800/828-1302.

Irrigation of Agricultural Crops

By American Society of Agronomy

This book, Monograph 30, replaces the earlier monograph published nearly 25 years ago. The eight sections of the new monograph focus on the shift in irrigation from expansion to conserva-

tion and on the effects of irrigation on the environment.

Sections offer an overview, philosophical and technical questions about irrigating, and an examination of the basic principle of soil-water, plant-water, and soil-plant atmosphere relations. Also included are field-level application principles, irrigation requirements and responses of selected agricultural crops, cultural practices,

and the effects of irrigation on the environment.

The monograph is jointly published by the American Society of Agronomy (ASA), the Crop Science Society of America (CSSA), and the Soil Science Society of America (SSSA). It is available for \$66 hardcover from ASA-CSSA-SSSA Headquarters Office, Book Order Department, 677 South Segoe Road, Madison, WI 53711.

Standard Handbook of Environmental Engineering

[Edited] by Robert A. Corbitt

Written by a team of experts in the field, this 1990 handbook helps engineers and specialists put important environmental engineering principles into practice.

Environmental engineers may find this hands-on reference useful when working with public works and regulatory agencies, universities, and a wide range of industries. It can be helpful for architects, planners, corporate managers, public officials, and others who need to understand, manage, or evaluate environmental engineering technology.

Individual chapters are devoted to air quality control, water supply,

wastewater disposal, waste management, stormwater, and hazardous waste management.

This 1,360-page, illustrated reference is a McGraw-Hill publication available from Island Press, Box 7, Covelo, CA 95428; telephone 1-800/828-1302.

New in Print is prepared by Paul G. DuMont, associate editor, *Soil & Water Conservation News*.

